

Claims

1. A drive train for a motor vehicle, having an internal  
5 combustion engine (1), having an electric machine (2), which upon  
starting of the engine (1) generates a torque, and having a  
clutch (3), which is disposed between the engine (1) and a gear  
train (4) by way of which a torque generated by the engine (1)  
can be transmitted to at least one vehicle drive wheel,  
10 characterized in that means (5, 6) are provided, which upon  
starting of the engine can actuate the clutch (3) in such a way  
that a first part of the torque generated upon starting of the  
engine by the electric machine (2) is transmitted to the at least  
one vehicle drive wheel, and a second part of the torque  
generated by the electric machine (2) and sufficient for starting  
15 the engine (1) is transmitted to the engine (1).

2. The drive train of claim 1, characterized in that the  
means include a control device (5).

3. The drive train of [one of the foregoing claims]  
20 claim 1, characterized in that for the control device (5),  
temperature- and/or rpm-dependent performance graphs for the  
drive torque of the engine (1) and/or for the starting torque  
and/or for the clutch engagement moment, which is predominantly  
25 dependent on the clutch engagement travel, are used.

4. The drive train of [one of the foregoing claims]  
30 claim 1, characterized in that the performance graphs are varied  
adaptively.

5. The drive train of [one of the foregoing claims]

claim 1, characterized in that the means include a regulating device (5).

6. The drive train of [one of the foregoing claims]  
5 claim 1, characterized in that the regulating device regulates the torque, transmitted upon starting of the engine (1) by the electric machine (2) to the at least one vehicle drive wheel, in such a way that rotational irregularities of the engine (1) upon starting of the engine (1) are decoupled from the at least one 10 vehicle drive wheel.

7. The drive train of [one of the foregoing claims]  
15 claim 1, characterized in that the decoupling of the rotational irregularities is effected at least until such time as the engine (1) has reached an rpm at which it is capable of outputting power.

20 8. The drive train of [one of the foregoing claims]  
claim 1, characterized in that the regulating device regulates the torque, transmitted upon starting of the engine (1) by the electric machine (2) to the at least one vehicle drive wheel, in such a way that the motor vehicle is kept at a stop until the engine (1) has reached an rpm at which it can output power.

25 9. The drive train of [one of the foregoing claims]  
30 claim 1, characterized in that the sensors are provided, which detect an exceptional state in which the motor vehicle, because of external forces, would undesirably put itself into motion, because the torque transmitted upon starting of the electric machine to the at least one vehicle drive wheel is too low to prevent the unwanted motion of the motor vehicle.

10. The drive train of [one of the foregoing claims]  
claim 1, characterized in that the exceptional state detected by the sensors is indicated to the driver.

5 11. The drive train of [one of the foregoing claims]  
claim 1, characterized in that a vehicle brake is provided, which is actuated automatically upon the occurrence of the exceptional state.

10 12. The drive train of [one of the foregoing claims]  
claim 1, characterized in that the vehicle brake is automatically released when the engine (1) has reached an rpm at which it can output power.

15 13. The drive train of [one of the foregoing claims]  
claim 1, characterized in that the regulating device regulates the torque, transmitted upon starting of the engine (1) by the electric machine (2) to the at least one vehicle drive wheel, in such a way that the motor vehicle puts itself in motion, before the engine (1) has reached an rpm at which it can output power.

20 14. The drive train of [one of the foregoing claims]  
claim 1, characterized in that the means include an automatic clutch (6), which actuates the clutch (3).

25 15. The drive train of [one of the foregoing claims]  
claim 1, characterized in that the regulating device (5) triggers the automatic clutch (6).

30 16. The drive train of [one of the foregoing claims]  
claim 1, characterized in that an automatic start-stop control is provided, which can stop the engine when the motor vehicle is

stopped and re-start it for driving on again.

17. The drive train of [one of the foregoing claims]  
claim 1, characterized in that only in stop and go operation of  
5 the motor vehicle, but not the first time an engine is started on  
a given trip, the first part of the torque generated upon  
starting by the electric machine (2) is transmitted to the at  
least one drive wheel.

10 18. The drive train of [one of the foregoing claims]  
claim 1, characterized in that the electric machine (2) is a  
starter.

Claims

---

A1 1. A drive train for a motor vehicle, having an internal  
5 combustion engine (1), having an electric machine (2), which upon  
starting of the engine (1) generates a torque, and having a  
clutch (3), which is disposed between the engine (1) and a gear  
train (4) by way of which a torque generated by the engine (1)  
can be transmitted to at least one vehicle drive wheel,  
10 characterized in that means (5, 6) are provided, which upon  
starting of the engine can actuate the clutch (3) in such a way  
that a first part of the torque generated upon starting of the  
engine by the electric machine (2) is transmitted to the at least  
one vehicle drive wheel, and a second part of the torque  
15 generated by the electric machine (2) and sufficient for starting  
the engine (1) is transmitted to the engine (1).

15 2. The drive train of claim 1, characterized in that the  
means include a control device (5).

20 3. The drive train of claim 1, characterized in that for  
the control device (5), temperature- and/or rpm-dependent  
performance graphs for the drive torque of the engine (1) and/or  
for the starting torque and/or for the clutch engagement moment,  
25 which is predominantly dependent on the clutch engagement travel,  
are used.

30 4. The drive train of claim 1, characterized in that the  
performance graphs are varied adaptively.

5. The drive train of claim 1, characterized in that the  
means include a regulating device (5).

6. The drive train of claim 1, characterized in that the regulating device regulates the torque, transmitted upon starting of the engine (1) by the electric machine (2) to the at least one vehicle drive wheel, in such a way that rotational irregularities of the engine (1) upon starting of the engine (1) are decoupled from the at least one vehicle drive wheel.

7. The drive train of claim 1, characterized in that the decoupling of the rotational irregularities is effected at least until such time as the engine (1) has reached an rpm at which it is capable of outputting power.

A/ 8. The drive train of claim 1, characterized in that the regulating device regulates the torque, transmitted upon starting of the engine (1) by the electric machine (2) to the at least one vehicle drive wheel, in such a way that the motor vehicle is kept at a stop until the engine (1) has reached an rpm at which it can output power.

20 9. The drive train of claim 1, characterized in that the sensors are provided, which detect an exceptional state in which the motor vehicle, because of external forces, would undesirably put itself into motion, because the torque transmitted upon starting of the electric machine to the at least one vehicle 25 drive wheel is too low to prevent the unwanted motion of the motor vehicle.

10. The drive train of claim 1, characterized in that the exceptional state detected by the sensors is indicated to the 30 driver.

11. The drive train of claim 1, characterized in that a

vehicle brake is provided, which is actuated automatically upon the occurrence of the exceptional state.

12. The drive train of claim 1, characterized in that the  
5 vehicle brake is automatically released when the engine (1) has  
reached an rpm at which it can output power.

13. The drive train of claim 1, characterized in that the  
regulating device regulates the torque, transmitted upon starting  
10 of the engine (1) by the electric machine (2) to the at least one  
vehicle drive wheel, in such a way that the motor vehicle puts  
itself in motion, before the engine (1) has reached an rpm at  
which it can output power.

14. The drive train of claim 1, characterized in that the  
means include an automatic clutch (6), which actuates the clutch  
(3).

20 15. The drive train of claim 1, characterized in that the  
regulating device (5) triggers the automatic clutch (6).

25 16. The drive train of claim 1, characterized in that an  
automatic start-stop control is provided, which can stop the  
engine when the motor vehicle is stopped and re-start it for  
driving on again.

30 17. The drive train of claim 1, characterized in that only  
in stop and go operation of the motor vehicle, but not the first  
time an engine is started on a given trip, the first part of the  
torque generated upon starting by the electric machine (2) is  
transmitted to the at least one drive wheel.

18. The drive train of claim 1, characterized in that the electric machine (2) is a starter.

A)

19. The drive train of claim 1, characterized in that the 5 electric machine (2) is a starter- generator.